

## Chapter 1

### Insect Pests and Diseases of Jackfruit Plant and Fruit: A Pictorial Study

Ahasan Ullah Khan<sup>\*a</sup> and Anayat Ullah Khan<sup>b</sup>

<sup>a</sup> Department of Entomology, Sylhet Agricultural University, Sylhet-3100, Bangladesh.

<sup>b</sup> Faculty of Science, Jashore University of Science and Technology, Jashore 7408, Bangladesh.

**Correspondence mail:** [ahasanullahsau@gmail.com](mailto:ahasanullahsau@gmail.com), Orcid: <https://orcid.org/0000-0002-7029-8215>

---

**Aim of the study:** Jackfruit (*Artocarpus heterophyllus* L.), being the national fruit of Bangladesh, is widely disbursed by most of the rural people. The plant products are used as human food, animal feed and wood source for furniture. The common insect pests and diseases are shoot and fruit borer (*Diaphania caesalis* Walker), Bark-eating caterpillar (*Indarbela tetraonis*), and trunk borer (*Batocera rufomaculata* De Geer) have been reported as major insect pests, while stem and fruit rot (*Rhizopus artocarpī*), bacterial dieback (*Colletotrichum gloeosporioides* Penz.), pink disease (*Pelliculana salmonicolor*), leafspot (*Phomopsis artocarpina*), fruit bronzing (*Pantoea stewartia* Smith) and gummosis (*Phomopsis artocarpī*) have been reported as major diseases. This paper has heighted the pictorial organize the insect pests and diseases of jackfruit plant and fruits.

**Keywords:** *Artocarpus heterophyllus* L., insect pests and diseases

**Background:** Jackfruit is the national fruit of Bangladesh. It is the most popular fruit in rural areas of Bangladesh. It ranks the 4<sup>th</sup> position as per production volume after banana, mango, and pineapple in Bangladesh. Jackfruit ranks the 3<sup>rd</sup> position with respect to fruit production in Malaysia. The jackfruit is a cross pollinated fruit tree and is mainly propagated by seeds. It is the major fruit tree at Madhupur tract in Bangladesh. It is a multipurpose tree plant bearing great importance for the farmers as fruit, timber, fodder, food, medicine, aroma, timbers, fruits, vegetables and fuel. It is often called poor man's fruit. The plants are medicine and used as anti-

bacterial, anti-diabetic, antioxidant, anti-inflammatory and anti-helminthic. It is a major source of carbohydrates, minerals and vitamins. In view of above facts, the present study was undertaken to pictorial organize about insect pests, and diseases of the jackfruit.

**Methodology:** To assess the current state of the research on insect pests and diseases of jackfruit, of the existing journal literature, books, report, blogs and newspaper were carried out. Keywords (Jackfruit, insect pests and diseases) search in the google, google scholar, web of science database ([www.thomsonreuters.com/web-of-science](http://www.thomsonreuters.com/web-of-science)) and a full-text search of the Science Direct ([www.sciencedirect.com](http://www.sciencedirect.com)) database were carried out. Information was also collected from farmers by personal communication.

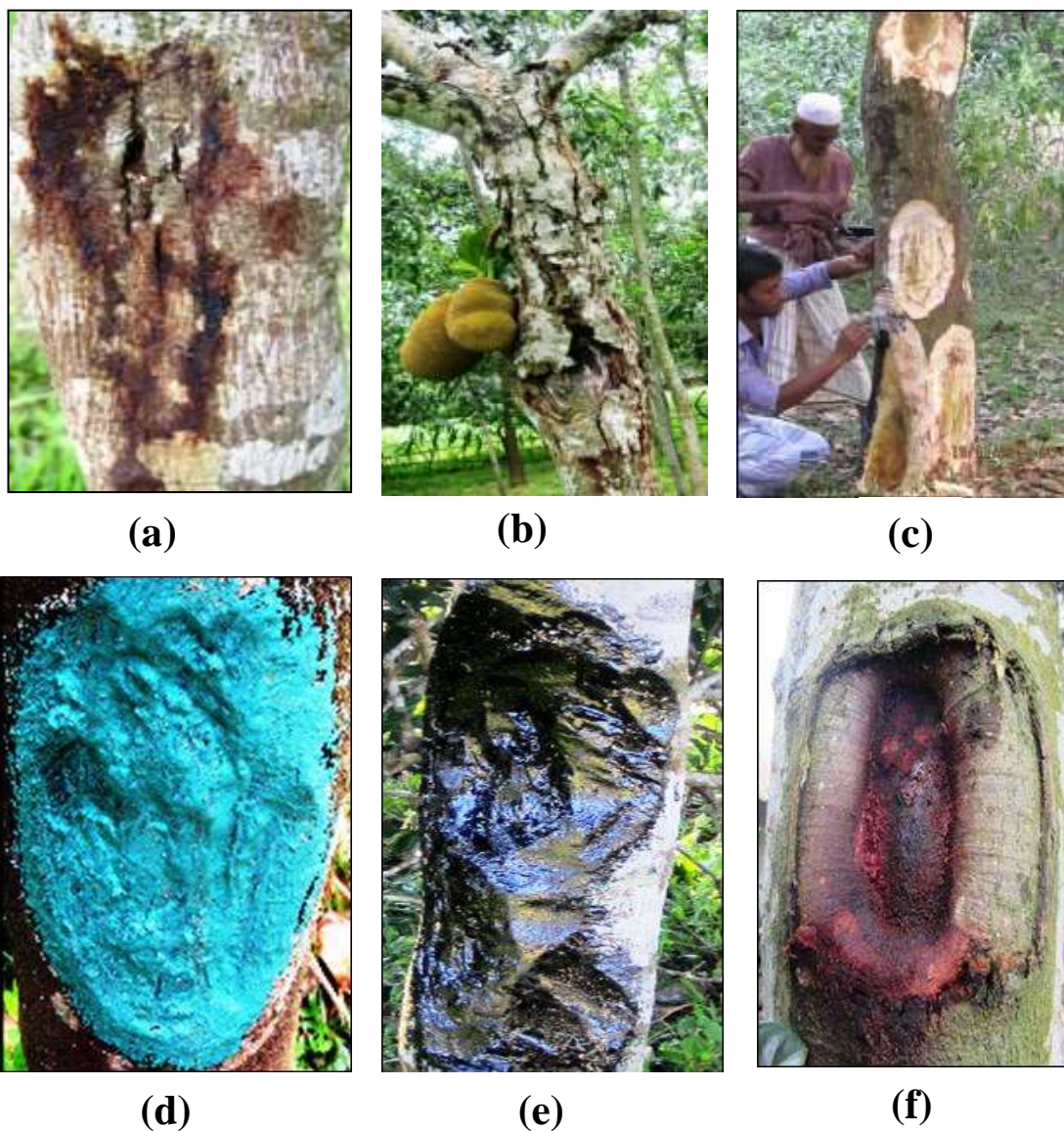
**Table 1. Common Insect Pests and Diseases of Jackfruit Plant and Fruit**

<b>Insect pests</b>	<b>Scientific name</b>	<b>Status</b>	<b>References</b>
Shoot and fruit borer	<i>Diaphania caesalis</i> Walker	Major	Soumya <i>et al.</i> , 2015; Kallekkattil and Krishnamoorthy, 2017.
Trunk borer	<i>Batocera rufomaculata</i> De Geer	Major	Hasan <i>et al.</i> , 2008; Ahmed <i>et al.</i> , 2013.
Bark-eating caterpillar	<i>Indarbela tetraonis</i>	Major	Yadav <i>et al.</i> , 2014
Bud weevil	<i>Ochyromera artocarp</i>	Minor	Yadav <i>et al.</i> , 2014
Mealybug	<i>Drosicha mangiferae</i>	Minor	Agounke <i>et al.</i> , 1988; Ragone, 1997.
Spittle bugs	<i>Cosmoscarta relata</i>	Minor	Yadav <i>et al.</i> , 2014
Scale insects	<i>Semelaspidus artocarp</i>	Minor	Yadav <i>et al.</i> , 2014
<b>Diseases</b>	<b>Scientific name</b>		<b>References</b>
Stem and fruit rots	<i>Rhizopus artocarp</i>	Major	Shamim <i>et al.</i> , 2011; Kallekkattil and Krishnamoorthy, 2017
Dieback	<i>Colletotrichum gloeosporioides</i> Penz.	Major	Gupta and Panday, 1985
Leafspot	<i>Phomopsis artocarpina</i> , <i>Pestalotia quepini</i> , <i>Colletotrichum lagenarium</i> , <i>Septoria artocarp</i>	Major	Gupta and Panday, 1985
Fruit bronzing	<i>Pantoea stewartia</i> Smith	Major	Gapasin <i>et al.</i> , 2014; Zulperi <i>et al.</i> , 2017
Gummosis	<i>Phomopsis artocarp</i>	Major	Elevitch and Manner 2006; Rahman and Afroz, 2016
Gray blight	<i>Pestalotia elasticola</i>	Minor	Morton, 1987
Anthracnose	<i>Colletotrichum</i> spp.	Minor	Gupta and Panday, 1985
Rust	<i>Uredo artocarp</i>	Minor	DAM, 2012; TFNet, 2012

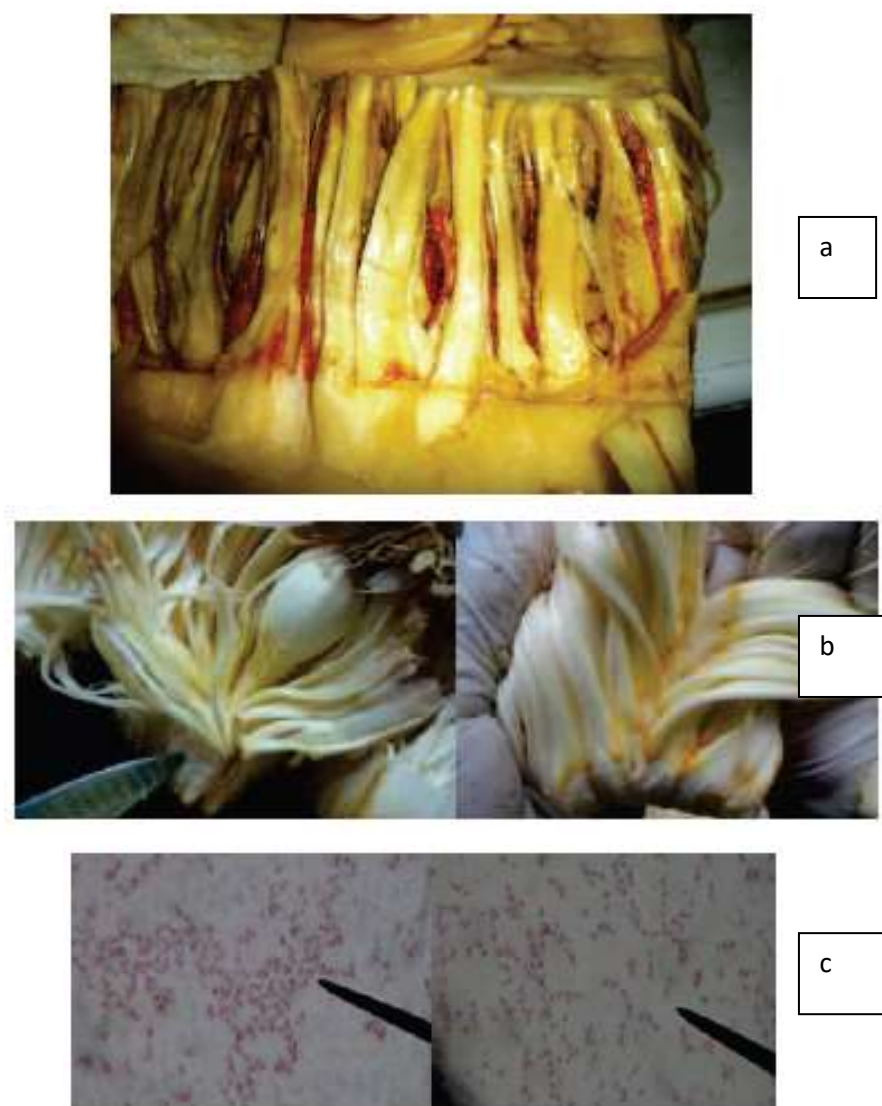


**Figure 1. Gummosis disease of jackfruit [Photo credit: Anayat]**





**Figure 2. Management of gummosis disease: (a) Gumming from the infected trunk, (b) Infected trunk, (c) Chiseling infected areas of the trunk, (d) Bordeaux paste given on the chiseled area, (e) Coal tar given on the chiseled area, and (f) Recovered trunk [Photo credit: Dr. Md. Abdur Rahman]**



**Figure 3. a). Naturally infected jackfruit showing the symptom of bronzing disease, b). Jackfruit injected with the bronzing bacterium showing the typical symptom at 2 weeks after inoculation, c). Gram stained cells of the bronzing bacterium showing Gram negative slightly pleomorphic rods. (1000X) [Photo credit: Gapasin]**



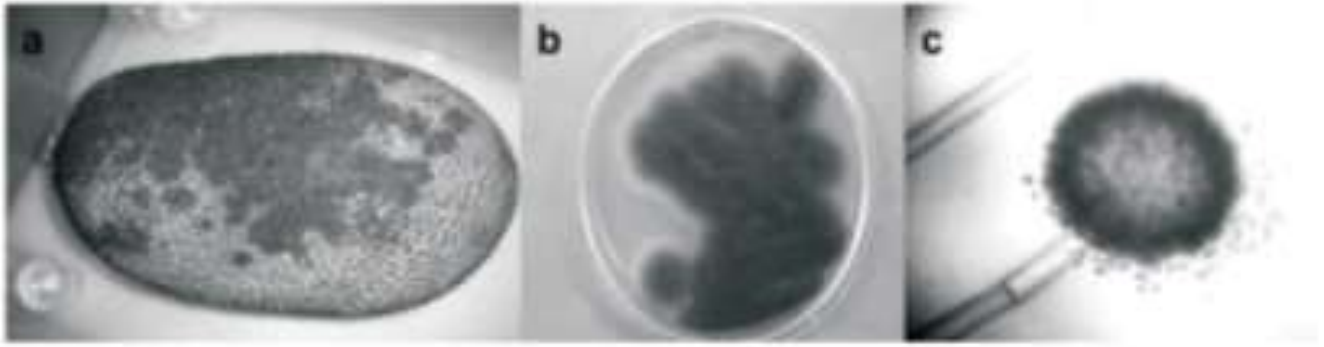
**Figure 4. Young jackfruits with rhizopus rot [photo credit: Scot Nelson]**





**Figure 5.** Light microscopic picture (10 magnification) of isolated pathogen *Rhizopus stolonifer* VBAM1, [photo credit: Ghosh]





**Figure 6. *Aspergillus niger*: a) symptoms in fruit, b) characteristics of the colony and c) microscopic characteristics, [Photo credit: Ragazzo-Sanchez]**



**Figure 7. Inflorescence; (A) female inflorescence showing a spongy core of 1500-2000 tiny flowers; (B) club shaped spike male inflorescence (ranges from 5 to 12 inches long); Photo credit: [Deivanai and Bhore, Kedah, Malaysia]**

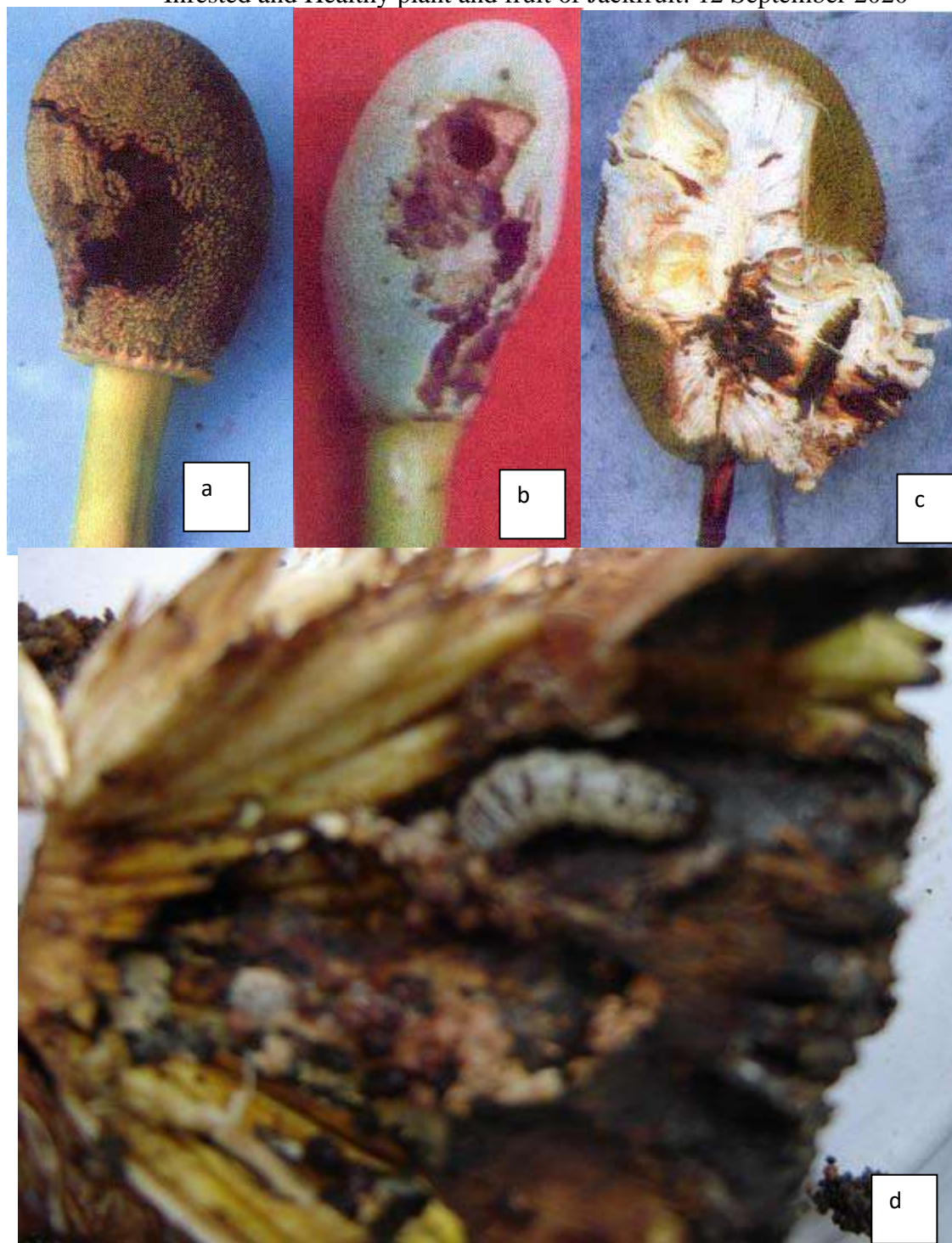


**Figure 8. Symptom of leaf blight on jackfruit seedlings, [Photo credit: Chowdhury]**

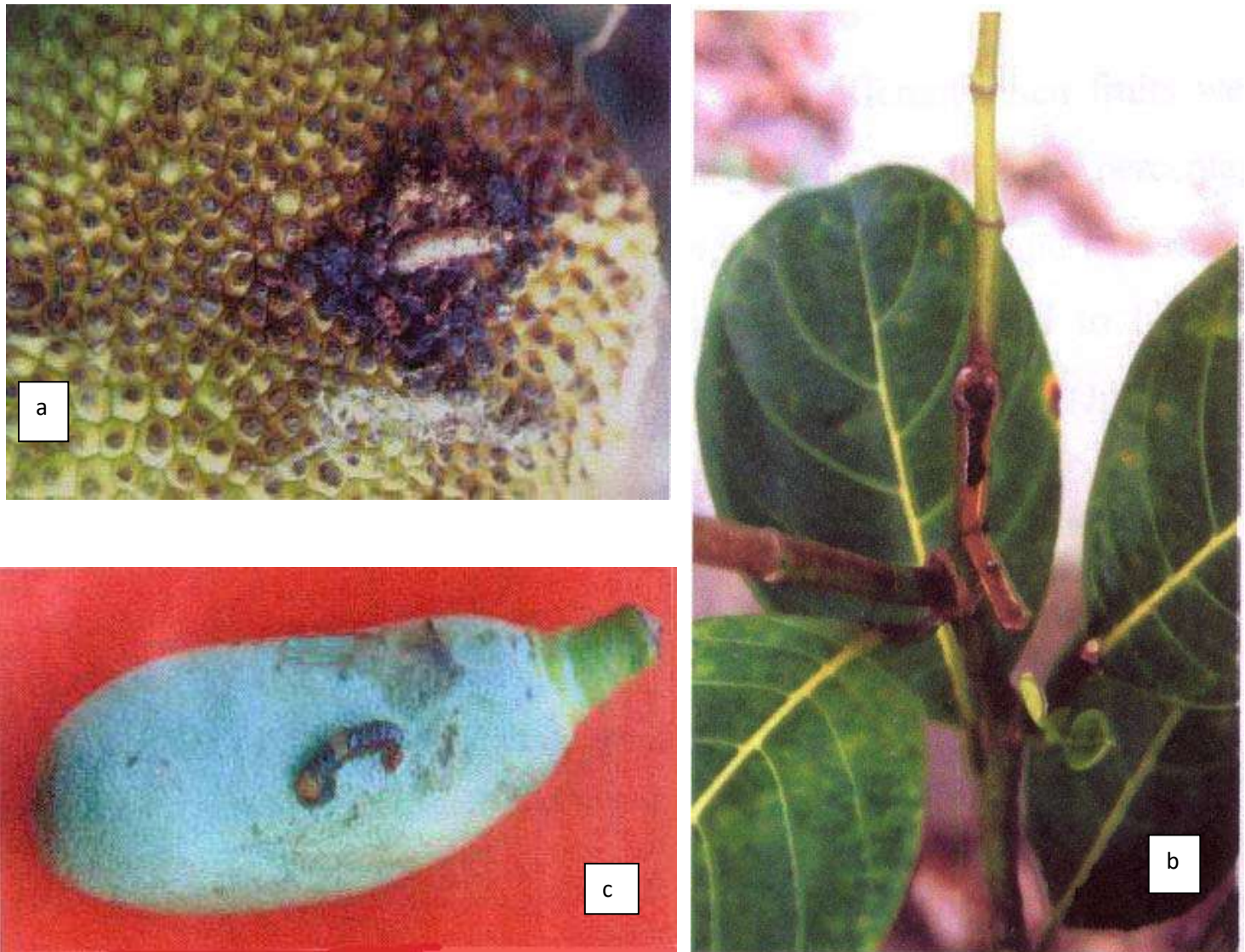


**Figure 9. Symptom of leaf spot on leaf of jackfruit seedling, [Photo credit: Chowdhury]**





**Figure 10. a). A dropped spike due to jackfruit borer infestation b) Tunnel in spike formed by jackfruit borer, c). Longitudinal section of mature fruit showing damage by jackfruit borer, d). Feeding of matured jackfruit by larvae of jackfruit borer**



**Figure 11. a). A caterpillar is boring mature fruit, b). Tunnel of jackfruit borer by feeding internal tissues of shoot, c). Caterpillar feeding on spike, [Photo credit: Mridha]**



a



b



c



**Figure 12. Discoloration and bronzing symptom produced on detached jackfruits two weeks after inoculation (b) and (c); control fruit was asymptomatic (a), [photo credit: Ibrahim]**



**Figure 13. Dieback of jackfruit tree [Photo credit: Konok]**



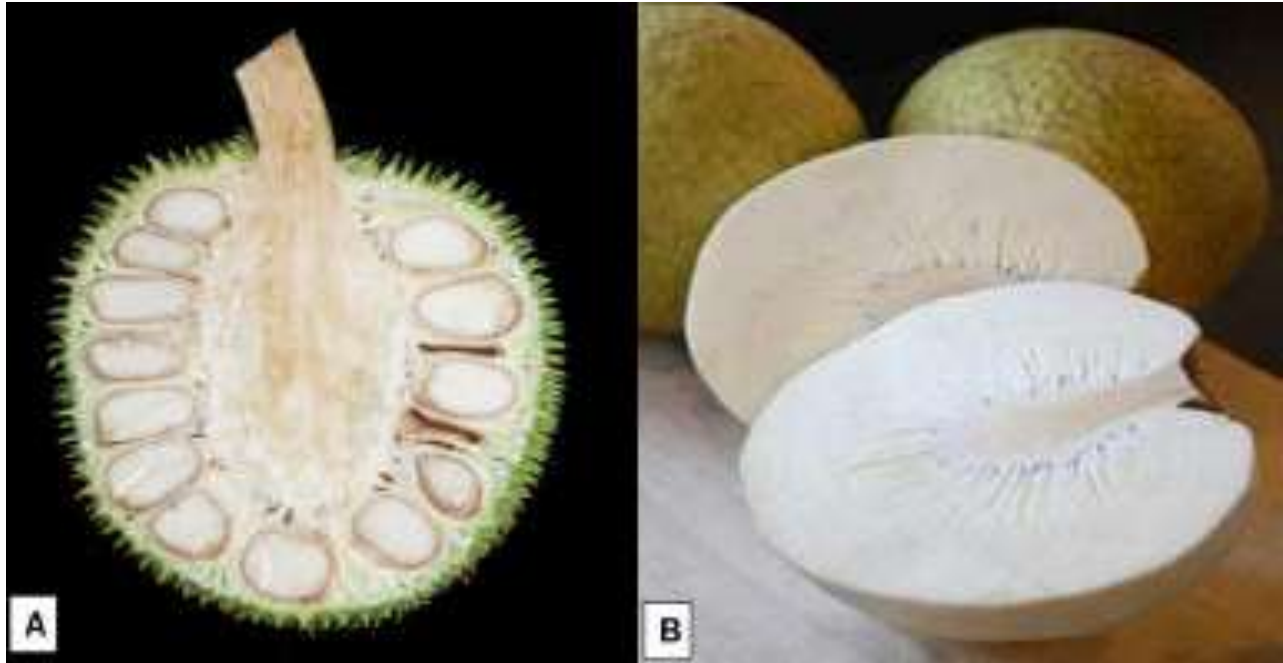


**Figure 14. Healthy jackfruit tree and fruits [Photo credit: Anayat]**



- Human food
- Animal feed
- Improve economy
- Provide nutritional requirement for human
- Provides raw materials for agro-based industry
- Improve digestion system

**Figure 15. Diversified uses of Jackfruit plant, fruits and byproducts**



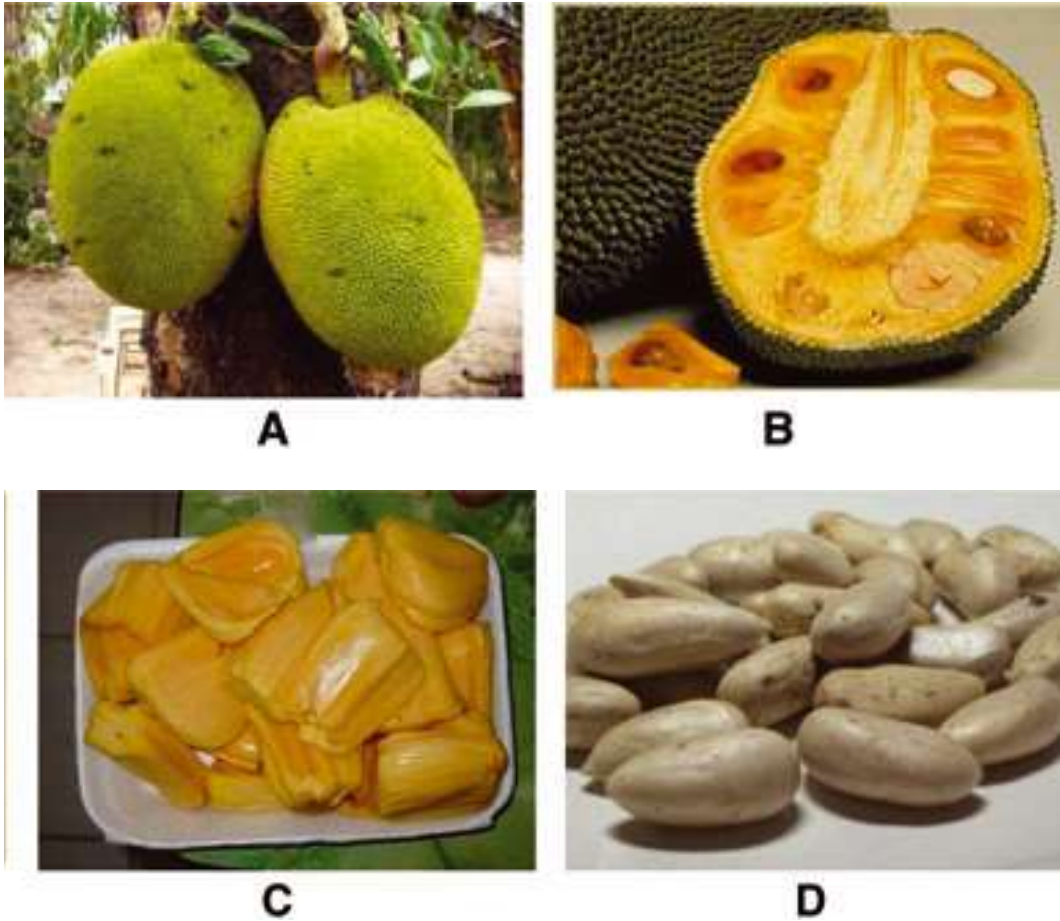
**Figure 16. *Artocarpus altilis* Fosb. fruit (breadfruit); (A) breadfruit with seeds; and (B) seedless breadfruit; [Photo credit: Deivanai and Subhash, Malaysia]**





**Figure 17. Jackfruit covered by polyethylene bag, [Photo credit: Mridha]**





**Figure 18. Different parts of jackfruit: (A) jackfruit; (B) cutting section of jackfruit; (C) jackfruit flesh; (D) jackfruit seed. [Photo credit: Swami]**



**A**



**B**



**C**



**D**

**Figure 19. Value-added products from jackfruit: (A) dehydrated jackfruit; (B) jackfruit cake; (C) jackfruit chips; (D) jackfruit leather (*Phanaspoli*), [photo credit: Swami]**

## References

- Agounke, D., Agricola, U. and Bokonon-Ganta, H.A. 1988. Invadens *Rastrococcus* Williams (Hemiptera, Pseducocidae), a serious exotic pest of fruit trees and other plants in West Africa. *Bull. Entomol. Res.*, 78(4): 629-630.
- Ahmed KU, Rahman MM, Alam MZ, Hossain MM and Miah MG. 2013. Evaluation of some control methods against the jackfruit trunk borer, *Batocera rufomaculata* De Geer (Cerambycidae: Coleoptera). *Bangladesh J. Zool.* 41(2):181-187.
- DAM (Department of Agricultural Marketing and Cooperatives). 2012. Department of Agriculture Malaysia. Laporan diagnostik makmal unit patologi Jabatan Pertanian 2010 dan 2011.
- Elevitch CR and Manner HI. 2006. Species profiles for pacific island agroforestry: *Artocarpus heterophyllus* (jackfruit). (Accessed December 2014).
- Gapasin RM, Garcia RP, Christine T, Cruz CS De and Borines LM. 2014. Fruit Bronzing: A new disease affecting Jackfruit caused by *Pantoea stewartii* (Smith) Mergaert *Pantoea stewartii* et al. *Annal. Tropic. Res.* 36(1):17-31.
- Gupta JH and Pundey IC. 1985. *Progressive Horticulture*. 17:361-62 [Cited from: Samaddar, H.N. Jackfruit. In: *Fruits-Tropical and Subtropical* (Vol. 2) (T.K. Bose, S.K. Mitra and D. Sanyal, Eds.). Naya Udyog, 206 Bidhan Sarani, Calcutta, 700 006. pp: 541-564.
- Hasan MK, Ahmed MM and Miah MG. 2008. Agro-Economic Performance of Jackfruit-Pineapple Agroforestry System in Madhupur Tract. *J. Agric. Rural Dev.* 6(1&2):147-156.
- Kallekkattil S and Krishnamoorthy A. 2017. Forecasting the incidence of Jackfruit shoot and fruit borer *Diaphania caesalis* Walker (Pyralidae: Lepidoptera) in Jackfruit (*Artocarpus heterophyllus* Lam.) ecosystems. *J. Entomol. Zool. Studies.* 5(1):483-487.
- Morton JF. 1987. *Fruits of Warm Climates*. Creative Resources Systems, Inc. 383-836 pp.
- Ragone D. 2003. Breadfruit. pp. 655-661. In: *Encyclopedia of food sciences and nutrition*. [Caballero L, Trugo and P Finglas (eds.)]. Academic Press, San Diego, California.
- Rahman MA and Afroz M. 2016. Survey on the diseases of jackfruit and some aspects of control measures for gummosis disease in Bangladesh. *Eco-friendly Agril. J.* 9(02):10-14.
- Shamim M, Khan MA and Singh KN. 2011. Inhibition of midgut protease of yellow stem borer (*Scirpophaga incertulas*) by cysteine protease-like inhibitor from mature jackfruit (*Artocarpus heterophyllus*) seed. *Acta Physiol Plant.* 33:2249-2257.
- Sharma JK, Mohanan C and Florence EJM. 1984. Outbreak of pink disease caused by *Corticium salmonicolor* in *Eucalyptus grandis*. *Tropical Pest Manage.* 30:253-255.
- Sharma JK, Mohanan C and Florence EJM. 1985. Disease survey in nurseries and plantations of forest tree species grown in Kerala. Kerala Forest Research Institute. Research Report No. 36. 268 p.
- Soumya K, Krishnamoorthy A, Patil P and Venkatesha MG. 2015. Evaluation of jackfruit germplasm against jack shoot and fruit borer, *Diaphania caesalis* Wlk. Lepidoptera : Pyralidae. *Pest Manage. Hortic. Ecosystems.* 21(1):8-10.
- TFNet 2012. Internet Resource. [http://www.itfnet.org/e-Newsletter/2012/May-Aug2012\\_newsletter.pdf](http://www.itfnet.org/e-Newsletter/2012/May-Aug2012_newsletter.pdf). Accessed 6 Jan 2018.
- Yadav SS, Bangarwa KS, Surender, Dhankhar S and Pannu RK. 2014. ICAR-JRF (PGS) in Agriculture Entomology and Nematology. CCS Haryana Agricultural University, Hisar-125004.
- Zulperi D, Manaf N, Ismail SI, Karam DS and Yusof MT. 2017. First report of *Pantoea stewartii* subsp. *stewartii* causing fruit bronzing of jackfruit (*Artocarpus heterophyllus*), a new emerging disease in Peninsular Malaysia. APS Publications. <https://doi.org/10.1094/PDIS-11-16-1689-PDN>.